

CLAIMS

What is claimed is:

1. A method of measuring thermal pole tip protrusion (TPTP) of a magnetic head included in a hard disk drive, the method comprising:
 - measuring a rate of errors contained in data by performing writing and reading operations while changing a level of an overshoot current (OSC);
 - detecting a minimum error rate based on the rate of errors measured while changing the level of the OSC;
 - measuring an error rate at a maximum OSC; and
 - determining a degree of TPTP by measuring a difference between the minimum error rate and the error rate at the maximum OSC.
2. The method of claim 1, wherein the measuring the rate of errors contained in data is performed on a test zone of a disk where the relationship between the OSC and the rate of errors of data is clearly disclosed.
3. The method of claim 2, wherein the test zone is located at an outer diameter of the disk.
4. The method of claim 1, wherein the measuring the rate of errors contained in data is performed at a low pressure.
5. The method of claim 1, further comprising:
 - comparing the difference between the minimum error rate and the error rate at the maximum OSC with a predetermined threshold; and
 - determining that the degree of TPTP of the magnetic head is low when the difference between the minimum error rate and the error rate at the maximum OSC is less than the predetermined threshold.
6. The method of claim 5, wherein the threshold is determined based on a head/disk interface (HDI) and quality criteria.

7. The method of claim 5, wherein the threshold is determined based on the characteristics of a zone of the disk wherein the measuring the rate of errors contained in data is performed.

8. The method of claim 1, wherein the rate of errors contained in data is a bit error rate (BER).

9. The method of claim 1, wherein the rate of errors contained in data is a channel statistics measurement (CSM).

10. A method of controlling a recording current to optimize a hard disk drive, comprising:
measuring the error rate of data by performing writing and reading operations while changing a level of OSC;
detecting a minimum error rate based on the rate of errors measured while changing the level of the OSC;
measuring an error rate at a maximum OSC;
determining a degree of TPTP of a magnetic head by measuring a difference between the minimum error rate and the error rate at the maximum OSC; and
determining degrees of adjusting a write current and the OSC versus temperature, based on the determined degree of TPTP.

11. The method of claim 10, wherein the determining degrees of adjusting the write current and the OSC comprises:

comparing the difference between the minimum error rate and the error rate at the maximum OSC with a predetermined threshold;

determining the degree of TPTP of the magnetic head is high when the difference between the minimum error rate and the error rate at the maximum OSC is higher than the predetermined threshold; and

setting recording current control parameters such that the degree of an increase in OSC for a magnetic head with a high-degree of TPTP is lower than that of an increase in OSC for a magnetic head with a low-degree of TPTP.

12. The method of claim 10, wherein the measuring the error rate of data is performed in a test zone of a disk where the relationship between the OSC and the error rate is clearly disclosed.

13. The method of claim 12, wherein the test zone is located at an OD of the disk.

14. The method of claim 10, wherein the measuring the error rate of data is performed at a low pressure.

15. The method of claim 10, wherein the error rate of data is a BER.

16. The method of claim 11, wherein the error rate is a CSM.

17. A method of controlling a recording coil current based on a level of TPTP of a magnetic head in a hard disk drive system, comprising:
determining a minimum data error rate based on OSC;
measuring a maximum data error rate at a maximum OSC;
determining a level of TPTP if a difference between the minimum data error rate and the maximum error rate is greater than or equal to a predetermined threshold;
adjusting the recording coil current of the hard disk drive system during write operations based on the level of TPTP.

18. The method of claim 17, wherein the determining the minimum data based on OSC comprises:
selecting a test zone on a disk in the hard disk drive system;
measuring a plurality of data error rates that result during a plurality of read/write operations to the disk as the OSC is incremented through a predetermined range; and
selecting a minimum data error rate based on the measured data error rates.

19. The method of claim 18, wherein the level of TPTP is stored on a maintenance cylinder of the disk.

20. The method of claim 18, wherein the level of TPTP is stored in a read only memory.

21. The method of claim 18, wherein the level of TPTP is stored in a non-volatile memory.

22. The method of claim 17, wherein if the difference between the minimum data error rate and the maximum error rate is less than the predetermined threshold, the level of TPTP is not used in adjusting the recording coil current of the hard disk drive system during write operations.

23. The method of claim 17, wherein the determining the level of TPTP is performed during a burn in test of the hard disk drive system.

24. A computer readable medium encoded with processing instructions for implementing the method of claim 17 performed by a computer having the hard disk drive system.

25. A hard disk drive system, comprising:

- a data storage disk that stores data;
- a reading/writing head having a recording coil which transfers the data with respect to the data storage disk;
- an actuator that causes relative movement between the reading/writing head and the data storage disk;
- at least one storage area storing a plurality of hard disk drive commands including a level of TPTP and current control parameters based on the level of TPTP for the recording coil;
- and
- a controller that
 - controls a recording coil current during writing operations of the reading/writing head based upon the current control parameters recalled from the at least one storage area,
 - develops the current control parameters for the recording coil of the reading/writing head based on the level of TPTP, and

downloads the current control parameters to the at least one storage area to be recalled while controlling the recording coil current.

26. The hard disk drive system as in claim 25, wherein the controller develops the current control parameters for the reading/writing head based on the level of TPTP by, determining a minimum data error rate based on a range of OSC of the recording coil;
measuring a maximum data error rate at a maximum OSC;
determining a level of TPTP if a difference between the minimum data error rate and the maximum error rate is greater than or equal to a predetermined threshold; and
determining current control parameters for the recording coil.

27. The hard disk drive system as in claim 25, wherein the at least one storage area is a maintenance cylinder of the disk.

28. The hard disk drive system as in claim 25, wherein the at least one storage area is a non-volatile memory of the hard disk drive system.